

# United States Patent [19]

Merki et al.

[11] Patent Number: 5,002,055

[45] Date of Patent: Mar. 26, 1991

[54] APPARATUS FOR THE BIOFEEDBACK CONTROL OF BODY FUNCTIONS

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[21] Appl. No.: 252,198

[22] Filed: Sep. 30, 1988

### Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 857,634, Apr. 29, 1986, Pat. No. 4,774,956.

### Foreign Application Priority Data

Apr. 13, 1988 [DE] Fed. Rep. of Germany ..... 3812584

[51] Int. Cl. 5 ..... A61B 5/00; A61M 5/14

[52] U.S. Cl. ..... 128/635; 128/670; 128/672; 128/736; 128/DIG. 12; 604/31; 604/66; 604/67

[58] Field of Search ..... 128/635, DIG. 12, DIG. 13, 128/672, 670, 736; 604/31, 65-67; 364/413.03, 413.04, 413.09, 413.11

### References Cited

#### U.S. PATENT DOCUMENTS

- 4,080,966 3/1978 McNally et al. ..... 604/66 X
- 4,121,574 10/1978 Lester ..... 128/736 X
- 4,378,014 3/1983 Elkow ..... 604/31
- 4,381,011 4/1983 Somers, 3rd ..... 128/635
- 4,551,133 11/1985 Beyl ..... 128/DIG. 12
- 4,633,878 1/1987 Bombardieri ..... 604/31 X

- 4,676,776 6/1987 Howson ..... 604/31
- 4,718,891 1/1988 Lipps ..... 604/31
- 4,774,956 10/1988 Kruse et al. ..... 128/635
- 4,878,896 11/1989 Garrison et al. ..... 128/DIG. 12 X

### FOREIGN PATENT DOCUMENTS

- 3018641 6/1981 Fed. Rep. of Germany ..... 604/31
- 8101794 7/1981 World Int. Prop. O. ..... 604/31
- 8500292 1/1985 World Int. Prop. O. ..... 604/31

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### ABSTRACT

An apparatus for the biofeedback control of body functions is proposed having at least one sensor for detecting biological body functions, a data memory for storing comparison values, a control unit or microprocessor (9, 16) and a therapy member, the control means (9, 16) activating the therapy system as a function of the measured values detected by the sensor and the comparison values. The therapy systems has a pump for the intravenous, intra-arterial, oral or intraluminal administration and a drug reservoir connected to the pump. The control unit and/or therapy means is provided with a memory, which stores the therapy objectives for the body functions with associated drug doses as a function of the detected measured values and comparison values. The pump is activated in such a way that it delivers the drug to the desired administration point from the reservoir in accordance with the predetermined doses, the sensor continuously detecting the effects of the drugs and in accordance with the action, a change is made to the activation of the pump.

8 Claims, 49 Drawing Sheets

